Catalogue of American Amphibians and Reptiles.

ZWEIFEL, RICHARD G. 1968. *Rana tarahumarae.*

Rana tarahumarae Boulenger
Tarahumara frog

Rana tarahumarae Boulenger, 1917: 416. Type-localities, "Ioquiro [= Yoquivo] and Barranca del Cobre, Sierra Tarahumaraé, N. W. Mexico," restricted to Yoquivo, Chihuahua, Mexico, by Smith and Taylor (1950: 327). Syntypes, British Museum (Natural History) 1947.2.28.-76–79 (formerly 1911.12.12.36–39) from Ioquiro collected by Mr. Neilly, and 1947.2.1.63–64 (formerly 1914.1.28.-148–149) from Barranca del Cobre, collected by Hans Gadow (examined by author).

• CONTENT. The species is monotypic, but see Comment.

• DEFINITION AND DIAGNOSIS. *Rana tarahumarae* is a large (snout-vent length to 102 mm) member of the *Rana boylii* group (Zweifel, 1955) with the following characteristics: inner metatarsal tubercle present but with outer lacking; dorsolateral folds typically lacking but occasionally present though poorly-developed; tympanum indistinct and usually tuberculate; males without vocal sacs.

Evidently the closest relative of *Rana tarahumarae* is *R. pustulosa*, which differs in having the tympanum smooth and relatively more distinct and in possessing dorsolateral folds; see Comment.

Rana pipiens is the only species of *Rana* known to be sympatric with *R. tarahumarae*. Obvious differences in *R. pipiens* include its smooth and distinct tympanum, dorsolateral folds, pointed toe-tips, and less extensive toe webbing.

• DESCRIPTIONS. The best descriptions of adult morphology are those of Boulenger (1917, 1920), and Kellogg (1932), based on the type-series. Wright and Wright (1949) quoted extensively from Boulenger (1920). Stebbins (1951) and Zweifel (1955) gave briefer descriptions. For detailed descriptions of color in life, see Stebbins (1951) and Wright and Wright (1949). The references cited above (except those for Boulenger and Kellogg) also include descriptions of the tadpole. Stebbins' (1951) description of eggs presumably of this species was repeated by Zweifel (1955).

Rana tarahumarae is a rather pustulose frog, brown dorsally with small black or brown spots on the body and dark crossbars on the front and hind limbs. The ventral surfaces are white, the throat and chest sometimes gray with the melanophores arranged in no definite pattern. Yellow may be present in the region of the groin. The tips of the toes are slightly expanded, and the toes are webbed broadly to the tips. The only external sexual dimorphism (except the larger size attained by the female) is in the first finger, which in the male is enlarged and bears a nuptial pad. No mating call has been reported for this species, the males of which lack vocal sacs.

The larva reaches a total length of at least 97 mm. The ground color of the body and tail is greenish gray, and there are prominent black spots on the tail fin and musculature. The labial fringe is indented at the corners of the mouth and there is a large gap in the anterior edge of the fringe. There is a maximum of five upper and three lower rows of labial teeth.

• ILLUSTRATIONS. A drawing of an adult frog by Stebbins (1951) also appears in two other books by Stebbins (1954, 1966). For photographs of frogs, see Zweifel (1955) and Wright and Wright (1949). Tadpoles are illustrated by drawings (Stebbins, 1951 and 1966; Zweifel, 1955) and a photograph (Wright and Wright, 1949). Stebbins (1951) and Zweifel (1955) gave drawings of the larval mouthparts; Stebbins (1951) illustrated the egg. Zweifel (1955) provides drawings of the skull, sacral vertebra, and hind foot. Zweifel (1955) and Stebbins (1951) give photographs of the habitat in Arizona. See Blair (1947) for photographs of the hind foot of *R. tarahumarae* and of several related species.

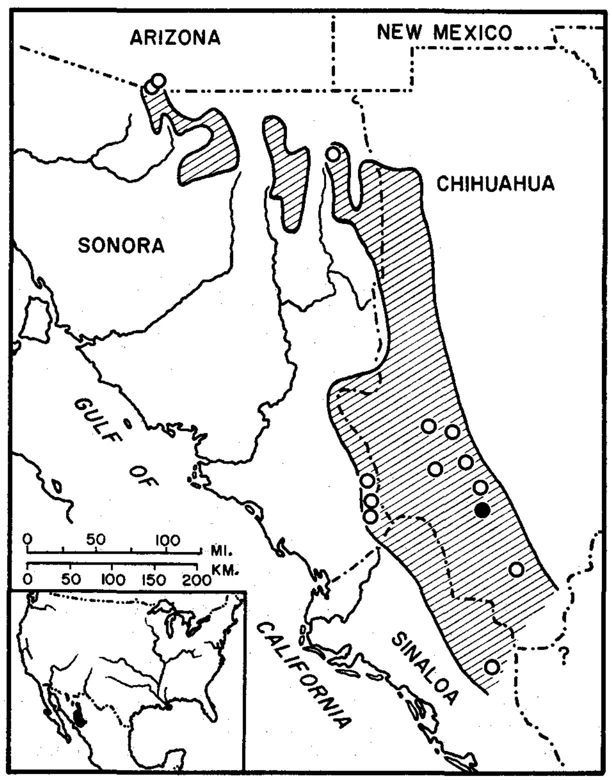
• DISTRIBUTION. *Rana tarahumarae* ranges from the south-central edge of Arizona through the Sierra Madre Occidental of eastern Sonora to southwestern Chihuahua and northern Sinaloa. Only the first published record for a given locality is cited below. Abbreviations indicate museum or private collection repositories of specimens not previously cited in the literature: Museum of Vertebrate Zoology, University of California (MVZ); Brigham Young University (BYU); Joseph F. Copp, private collection (JFC).

The Arizona localities are all within 13 miles of the Mexican boundary, west and northwest of Nogales in Santa Cruz County: Tinaja Canyon, 3 mi. SW Tumacacori (Williams, 1960); Yank's Spring and nearby areas in Sycamore Canyon (Stebbins, 1951; Little's [1940: 262] sight record for "Bear Valley a few miles west of Peña Blanca Springs" presumably refers to this population); "near Pena Blanca Springs" (Campbell, 1931; the exact locality presumably is Alamo Spring, about 2.5 mi. SW of Peña Blanca Springs, see Wright and Wright, 1949: 555); Peña Blanca Springs (Campbell, 1934).

The only localities known in Sonora are in the El Tigre Mountains in the northeast (below Santa María Mine, Smith, 1939; 10 mi. N Pilares, Zweifel, 1955) and in the extreme southeast (Curohui, 12 mi. ESE San Bernardo, Zweifel, 1955; Guirocoba, Bogert and Oliver, 1945 [reported as *R. pustulosa*]; near Sonora-Chihuahua border above Alamos, ca. 6000 ft., MVZ). The following localities are on record for Chihuahua: Yoquivo and Barranca del Cobre (Boulenger, 1917); Arroyo Tecolote de Los Loera, Rio Los Loera (Zweifel, 1955); Mojarachic (Smith and Taylor, 1948); 25.5 mi. S Creel on La Bufa road (BYU); 4 mi. NE Cuiteco (BYU); Maguorichic (BYU). A record for Los Ornos, Sinaloa, 52 mi. E. Mocorito (JFC) is the southernmost for the species.

Rana tarahumarae inhabits canyon streams (some of which may in the dry season have water only in isolated potholes) at elevations between about 1500 and 6000 feet. Associated vegetation includes oak woodland, tropical deciduous forest and pine forest.

The relatively meager literature on *Rana tarahumarae* is marred by a number of erroneous locality records. Linsdale (1933) reported a supposed *Rana tarahumarae* said to have been obtained on the Gila River in Grant County (Socorro County at that time) in southwestern New Mexico. Stebbins (1951) could not distinguish the specimen from *Rana muscosa* and noted that other specimens received from the same col-



MAP. The solid symbol marks the restricted type-locality; hollow symbols indicate other localities. The shaded areas estimate areas within which suitable habitat occurs; extent of range to the south is unknown.

lector came from the habitat of *Rana muscosa* in southern California. Zweifel too (1955) examined the specimen and concurred with Stebbins' determination. Stebbins made an unsuccessful effort to find these frogs at the stated locality, so it is virtually certain that there was an error in recording locality data. Little and Keller (1937) and Little (1940) recorded *Rana tarahumarae* from, respectively, the Rio Grande near Mesilla Dam in southern New Mexico and Rose Creek in Gila County, south-central Arizona. Both Stebbins (1951) and Zweifel (1955) examined specimens upon which these records were based and found them to be the introduced bullfrog, *Rana catesbeiana*.

Bogert and Oliver (1945) referred two specimens from Oblatos, Jalisco, to *Rana tarahumarae*, but Blair (1947) considered the allocation tentative, pending the availability of more specimens. Zweifel (1955) considered them to be *Rana pustulosa*. Stebbins (1966) gave the range of *tarahumarae* as extending southward to Jalisco, presumably on the basis of the record by Bogert and Oliver. Western Texas was included in the range by Smith and Taylor (1948) because they accepted the records for New Mexico and anticipated the discovery of the species in the lower Rio Grande (Zweifel, 1955).

• FOSSIL RECORD. None.

• PERTINENT LITERATURE. Campbell's reports (1931, 1934) contain brief ecological notes, as do the accounts by Wright and Wright (1942, 1949). Stebbins (1951) described the habitat in Sycamore Canyon and presented some information on food habits. Zweifel (1955) summarized knowledge of the species and added original observations on ecology and life history. Several authors commented on the similarities in morphology and ecology between *Rana tarahumarae* and *Rana boylii* of California (Boulenger, 1920; Campbell, 1931, 1934; Wright and Wright, 1942, 1949; Stebbins, 1951). Zweifel (1954) compared some skeletal elements in several *Rana*, and Lynch (1965) discussed fusion of sacral and presacral vertebrae in *R. tarahumarae* and other species. For more extensive comparisons among members of the *Rana boylii* species group, see Blair (1947) and Zweifel (1955). Mentions in checklists or other brief accounts (Blair, 1957; Boulenger, 1919; Duellman, 1955; Lowe, 1964; Schmidt, 1953; Stejneger and Barbour, 1943 and earlier editions) together with papers cited elsewhere in the present work represent the complete bibliography for the species, so far as I can determine.

• ETYMOLOGY. The specific name refers to the Sierra Tarahumare, the mountainous area where the type-specimens were found.

COMMENT

Relationships among the Mexican members of the *Rana boylii* species group are poorly understood. *Rana tarahumarae* is closely similar to *Rana pustulosa*, and the differences between the two forms are of a kind and magnitude easily encompassed within the range of variation of a single species. The southernmost locality for *tarahumarae* is 150 miles northwest of the northernmost for *pustulosa*, which happens to be the type-locality. It is virtually certain that the intervening region is inhabited by one or both of the forms, but until specimens become available for this area it cannot be said whether the two intergrade, overlap, or remain allopatric.

I have examined specimens of *Rana* from western Jalisco, Mexico (where one might expect to find *pustulosa*), that resemble both *pustulosa* and *tarahumarae*, but I cannot with confidence assign them to either species. These may represent a geographic variant of *pustulosa* or may belong to an unnamed species, one characteristic of which may be a smaller size than either of the two other forms. The presence of frogs much like *tarahumarae* in Aguascalientes (18 mi. W, 2 mi. S Aguascalientes, 6000 ft., Univ. Kansas Mus. Nat. Hist. 29827–29), well within the area inhabited by *pustulosa*, and almost 400 miles southeast of the known range of *tarahumarae*, adds to the confusion. Any consideration of *pustulosa* must also take into account the statement of Webb (1966) that *Rana sinaloae* is a synonym of *Rana pustulosa*.

Although I recognize the possibility that *tarahumarae* and *pustulosa* may be conspecific, I do not feel that the information presently available is sufficient to warrant a change in nomenclature.

LITERATURE CITED

Blair, A. P. 1947. A new *Rana* from San Luis Potosi, Mexico. Amer. Mus. Novitates (1353): 1–17.

— 1957. Amphibians, pp. 211–271. *In* W. F. Blair, *et al.*, Vertebrates of the United States. McGraw-Hill Book Co., New York. ix + 819 p.

Bogert, Charles M., and James A. Oliver. 1945. A preliminary analysis of the herpetofauna of Sonora. Bull. Amer. Mus. Nat. Hist. 83(6): 297–426.

Boulenger, G. A. 1917. Descriptions of new frogs of the genus *Rana*. Ann. Mag. Nat. Hist. (ser. 8) 20(120): 413–418.

— 1919. Synopsis of the American species of *Rana*. *Ibid.* (ser. 9) 3(16): 408–416.

— 1920. A monograph of the American frogs of the genus *Rana*. Proc. Amer. Acad. Arts Sci. 55(9): 413–480.

Campbell, Berry. 1931. *Rana tarahumarae*, a frog new to the United States. Copeia 1931(4): 164.

— 1934. Report on a collection of reptiles and amphibians made in Arizona during the summer of 1933. Occ. Papers Mus. Zool. Univ. Michigan (289): 1–10.

Duellman, William E. 1955. Notes on reptiles and amphibians from Arizona. Occ. Papers Mus. Zool. Univ. Michigan (569): 1–14.

Kellogg, Remington. 1932. Mexican tailless amphibians in the United States National Museum. U. S. Natl. Mus. Bull. (160): iv + 224 p.

Linsdale, Jean M. 1933. A specimen of *Rana tarahumarae* from New Mexico. Copeia 1933(4): 222.

Little, Elbert L., Jr. 1940. Amphibians and reptiles of the Roosevelt Reservoir area, Arizona. Copeia 1940(4): 260–265.

—, and John J. Keller. 1937. Amphibians and reptiles of the Jornada Experimental Range, New Mexico. Copeia 1937(4): 216–222.

Lowe, Charles H. 1964. An annotated check list of the amphibians and reptiles of Arizona, p. 153–174. *In* C. H. Lowe, ed., The Vertebrates of Arizona. Univ. Arizona Press, Tucson.

Lynch, John D. 1965. Sacral fusions in some neotropical *Rana*. Trans. Illinois Acad. Sci. 58(3): 195–199.

Schmidt, Karl P. 1953. A checklist of North American amphibians and reptiles. Sixth edition. Amer. Soc. Ichthyol. and Herpetol. viii + 280 p.

Smith, Hobart M. 1939. An annotated list of the Mexican amphibians and reptiles in the Carnegie Museum. Ann. Carnegie Mus. 27(21): 311–320.

—, and Edward H. Taylor. 1948. An annotated checklist and key to the Amphibia of Mexico. U. S. Natl. Mus. Bull. (194): iv + 118 p.

— 1950. Type localities of Mexican reptiles and amphibians. Univ. Kansas Sci. Bull. 33(8): 313–380.

Stebbins, Robert C. 1951. Amphibians of western North America. Univ. California Press, Berkeley. ix + 539 p.

— 1954. Amphibians and reptiles of western North America. McGraw-Hill Book Co., New York. xxiv + 528 p.

— 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Co., Boston. xiv + 279 p.

Stejneger, Leonhard, and Thomas Barbour. 1943. A check list of North American amphibians and reptiles. Fifth edition. Bull. Mus. Comp. Zool. 93(1): xix + 260 p.

Webb, Robert G. 1966. The lizard *Sceloporus bulleri* in western Mexico. Amer. Phil. Soc. Year Book, 1965: 356–357.

Williams, Kenneth L. 1960. Taxonomic notes on Arizona herpetozoa. Southwestern Nat. 5(1): 25–36.

Wright, Albert Hazen, and Anna Allen Wright. 1949. Handbook of frogs and toads of the United States and Canada. Third edition. Comstock Publ. Co., Ithaca, New York. xii + 640 p.

Wright, Anna Allen, and Albert Hazen Wright. 1942. Handbook of frogs and toads. The frogs and toads of the United States and Canada. Comstock Publ. Co., Ithaca, New York. xi + 286 p.

Zweifel, Richard G. 1954. A new *Rana* from the Pliocene of California. Copeia 1954(2): 85–87.

— 1955. Ecology, distribution, and systematics of frogs of the *Rana boylei* group. Univ. California Publ. Zool. 54 (4): 207–292.

R. G. ZWEIFEL, AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK 10024.

Published 8 July 1968 by the American Society of Ichthyologists and Herpetologists. Publication is supported by National Science Foundation grant G24231.

Primary editor for this account, James D. Anderson.